



# Designing Economically Viable Low-Cost Irrigation Systems in Mali's Drought Prone Regions

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## Abstract

Mali's arid regions face significant challenges in agricultural productivity due to erratic rainfall and limited water resources. Drought-prone areas require innovative low-cost irrigation solutions that are both economically viable and sustainable. A mixed-method approach combining field surveys, stakeholder consultations, and prototype testing was employed. Statistical analysis using regression models was used to assess the economic viability of proposed systems. Prototype tests in Mali's semi-arid zones demonstrated that a gravity-fed drip irrigation system could deliver water at an average flow rate of 15 liters per hour with a reliability coefficient of 0.85, ensuring consistent crop yields under drought conditions. The designed irrigation systems showed promise for improving agricultural productivity in Mali's arid regions while maintaining economic feasibility and environmental sustainability. Implementing these low-cost irrigation solutions requires government support to subsidize initial costs and promote adoption among small-scale farmers. Additionally, further research is needed on the long-term impacts of such interventions. The maintenance outcome was modelled as  $Y = \beta_0 + \beta_1 X + u_i + \varepsilon_i$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** *Geographic, Africa, Yield, Flooded, Micropile, Vulnerability, Hydrology, Modelling, WaterHarvesting, ContourFarm, SiteAnalysis*

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